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Environmental Management Division

Environmental Management Services

Bibliography of Water Standards and Studies Section Publications 1982

Environmental Standards and Studies

Water Standards and Studies Report #83-1

BIBLIOGRAPHY
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WATER STANDARDS AND STUDIES SECTION
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1982

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DEPARTMENT OF ENVIRONMENT AND WORKPLACE SAFETY AND HEALTH.

WATER STANDARDS AND STUDIES REPORT #83-1

ABSTRACT

In 1982, the Water Standards and Studies Section, Environmental Management Services Branch, Department of Environment and Workplace Safety and Health, produced thirty-one reports, one audio-visual program and contributed to a second audio-visual program/produced by Environmental Standards and Studies.

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INTRODUCTION

The reports and audio-visual programs listed in this document were prepared by the Water Standards and Studies Section, Environmental Management Services Branch of the Department of Environment and Workplace Safety and Health. Each report has been distributed by the Division as it becomes available. Enquiries for copies should be directed to the following person:

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TECHNICAL REPORTS

REPORT 82-1 Beck, A. E. (1982). 1980 Mercury Levels in Fish of the Assiniboine, Red, Souris and Winnipeg Rivers. Environmental Management Division. February, 1982. 37pp.

SUMMARY

As a component of the Biomonitoring Program, mercury concentrations in the muscle tissue of fish have been monitored since 1978. Mean mercury concentrations exceed 0.50 ug/g in many species important to localized sport fisheries of the Assiniboine, Red, Souris and Winnipeg Rivers. Mean 1980 levels were observed to show little statistically significant change from those of previous years. Mercury burdens of the monitored river systems do not appear to have altered substantially since 1978.

REPORT 82-2 Hughes, C. (1982). A Survey of Aquatic Macrophytes and Water Quality in Max, William, Adam, Bower, Sharpe and Metigoshe Lakes. Environmental Management Division. February, 1982. 19pp.

SUMMARY

On August 11 and 12, 1981 a survey of emergent and submergent vegetation and water chemistry was carried out on six lakes in the Turtle Mountain Provincial Park area. The survey was conducted in response to complaints about aquatic macrophyte (weed) growth on Max Lake. William, Adam, Bower, Sharpe and Metigoshe Lakes were included in the survey. Historical data were limited and no conclusions could be drawn regarding the causes for an unusually heavy growth of macrophytes on Max Lake in 1981. Also, it could not be determined if there were unusually heavy growths of macrophytes in the other lakes during 1981. There was, however, a heavy algae bloom in Bower Lake which may have been in the process of dying off and using up oxygen in the middle and lower portions of the water column. It

was also possible that some sewage may have been present in Bower Lake. Two dead Walleye (Stizostedion vitreum) were noted in Max Lake and it was probable that these fish died in a "summer kill" created by the dying off of a previous algae bloom.

REPORT 82-3 Hughes, C. (1982). A Report on the Trophic Status of Moose Lake. Environmental Management Division. May, 1982. 7pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of low algae populations and good water clarity. Trophic state indices (TSI) indicated that Moose Lake was mesotrophic to eutrophic in character.

REPORT 82-4 Hughes, C. (1982). A Report on the Trophic Status of Wanipigow Lake. Environmental Management Division. May, 1982. 7pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of moderate algae population and relatively poor water clarity. Trophic state indices (TSI) indicated that Wanipigow Lake was mesotrophic to eutrophic in character.

REPORT 82-5 Hughes, C. (1982). A Report on the Trophic Status of Bird, Beresford and Booster Lakes. Environmental Management Division. May, 1982. 7pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' results for 1981 were indicative of low to moderate algae

populations on Bird and Booster Lakes and moderate to high algae populations on Beresford Lake. Secchi disc results for 1981 were indicative of fair water clarity in Beresford Lake and moderately good to good water clarity in Bird and Booster Lakes. Trophic state indices (TSI) indicated that Bird and Booster Lakes were mesotrophic in character and Beresford Lake was mesotrophic to eutrophic.

REPORT 82-6 Hughes, C. (1982). A Report on the Trophic Status of Brereton Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1982 chlorophyll and transparency results were indicative of relatively high algae populations and relatively poor water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Brereton Lake is eutrophic in nature.

REPORT 82-7 Hughes, C. (1982). A Report on the Trophic Status of Jessica Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderately high algae populations and moderately poor water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Jessica Lake is mesotrophic to eutrophic in nature.

REPORT 82-8 Hughes, C. (1982). A Report on the Trophic Status of Caddy Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderate algae populations and moderate water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Caddy Lake is mesotrophic to eutrophic in nature.

REPORT 82-9 Hughes, C. (1982). A Report on the Trophic Status of Barren Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 7pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of high algae populations and reduced water clarity, respectively. Trophic state indices (TSI) indicated that Barren Lake was eutrophic in nature.

REPORT 82-10 Hughes, C. (1982). A Report on the Trophic Status of Florence and Marion Lakes, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 7pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of moderate algae populations and moderate water clarity, on both Florence and Marion Lakes. Trophic state indices

(TSI) indicated that Florence Lake was mesotrophic and that Marion Lake was mesotrophic to oligotrophic in character.

REPORT 82-11 Hughes, C. (1982). A Report on the Trophic Status of Red Rock Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderate algae populations and moderate water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Red Rock Lake was mesotrophic to eutrophic in character.

REPORT 82-12 Hughes, C. (1982). A Report on the Trophic Status of West Hawk Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of low algae populations and good water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that West Hawk Lake was oligotrophic to mesotrophic in nature.

REPORT 82-13 Hughes, C. (1982). A Report on the Trophic Status of Big Whiteshell Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 11pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of high nuisance algae populations and moderate water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Big Whiteshell Lake was eutrophic.

REPORT 82-14 Hughes, C. (1982). A Report on the Trophic Status of Falcon Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of low algae populations and good water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Falcon Lake was mesotrophic in nature.

REPORT 82-15 Hughes, C. (1982). A Report on the Trophic Status of Betula Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderate algae populations and low water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Betula Lake was eutrophic in nature.

REPORT 82-16 Hughes, C. (1982). A Report on the Trophic Status of White Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderate algae populations and moderate water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that White Lake was mesotrophic to eutrophic in nature.

REPORT 82-17 Hughes, C. (1982). A Report on the Trophic Status of Star Lake, Whiteshell Provincial Park. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1978 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of low algae populations and moderate water clarity, respectively. The 1981 results were compared to other years and other Whiteshell Provincial Park lakes. Trophic state indices (TSI) indicated that Star Lake was mesotrophic to eutrophic in nature.

REPORT 82-18 Williamson, D. A. (1982). A Conductivity Study on the La Salle River, 1980-81. Environmental Management Division. March 1982. 31pp.

Saline infiltration has deteriorated the water quality of the La Salle River during past years, especially during periods of low flows. Conductivity analyses performed on samples collected during July, 1980, October, 1980 and August, 1981 indicated four areas of relatively high salinity.

Approximately 3.7 x $10^6 m^3$ of water was diverted from the Assiniboine River during the fall of 1980 in an attempt to improve the water quality of the La Salle River. Conductivity analyses indicated that flow augmentation initially moved the saline water downstream. The saline water was later diluted as mixing occurred.

Conductivity results from samples collected during January, February and March, 1981 indicated that greater increases in salinity occurred in three areas previously identified as being subject to possible saline groundwater infiltration than were recorded from other areas. The largest increase (1412 to 7676 umhos/cm) occurred immediately below the Hogue Dam from December 11, 1980 to January 13, 1981. These increases were attributed to groundwater influences as opposed to the concentrating factor of ice formation.

Most conductivities were reduced during March, 1981 due to the influx of snow melt-water.

REPORT 82-19 Hughes, C. (1982). A Report on the Trophic Status of Boissevain Reservoir. Environmental Management Division. May, 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1979 to 1981 were presented. The 1981 chlorophyll and transparency results were indicative of moderate algae populations and low water clarity, respectively. Trophic state indices (TSI) indicated that Boissevain Reservoir was mesotrophic to eutrophic in nature. However, copper sulphate was used periodically to reduce algae populations. Therefore, the results may not accurately reflect the trophic status.

REPORT 82-20 Hughes, C. (1982). A Report on the Trophic Status of Lake Winnipeg. Environmental Management Division. May, 1982. 9pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1980 and 1981 were indicative of high algae populations and low water clarity, respectively. Trophic state indices (TSI) indicated that Lake Winnipeg was eutrophic in nature.

REPORT 82-21 Hughes, C. (1982). A Report on the Trophic Status of Lake Manitoba. Environmental Management Division. May, 1982. 8pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1980 and 1981 were indicative of moderately high algae populations and low water clarity, respectively. Trophic state indices (TSI) indicated that Lake Manitoba is mesotrophic to eutrophic in nature.

REPORT 82-22 Hughes, C. (1982). A Report on the Trophic Status of Metigoshe Lake. Environmental Management Division. May, 1982. 8pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of moderate algae populations and moderate water clarity, respectively. Trophic state indices (TSI) indicated that Metigoshe Lake was mesotrophic to eutrophic in nature.

REPORT 82-23 Hughes, C. (1982). A Report on the Trophic Status of St. Malo Reservoir. Environmental Management Division. May, 1982. 8pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1980 and 1981 were indicative of low algae populations and moderate water clarity, respectively. Trophic state indices (TSI) indicated that St. Malo Reservoir was mesotrophic to eutrophic. However, since copper sulfate was used periodically for reducing algae populations, the results may not accurately reflect the true trophic status.

REPORT 82-24 Hughes, C. (1982). A Report on the Trophic Status of Clearwater and Cormorant Lakes. Environmental Management Division. May, 1982. 8pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of low algae populations and high water clarity, respectively. Trophic state indices (TSI) indicated that both Clearwater and Cormorant Lakes were oligotrophic. However, the data is not sufficient to delineate the trophic status with certainty.

REPORT 82-25 Hughes, C. (1982). A Report on the Trophic Status of Setting Lake. Environmental Management Division. May 1982. 8pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc results for 1981 were indicative of low to moderate algae populations and moderate water clarity, respectively. Trophic state indices (TSI) indicated that Setting Lake was mesotrophic to eutrophic in nature.

REPORT 82-26 Hughes, C. (1982). A Report on the Trophic Status of Pelican Lake. Environmental Management Division. May 1982. 10pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1979 to 1981 were presented. Chlorophyll and transparency results for 1981 were indicative of high nuisance algae populations and low water clarity, respectively. Trophic state indices (TSI) indicated that Pelican Lake was eutrophic in nature.

REPORT 82-27 Hughes, C. (1982). A Report on the Trophic Status of Six Lakes on the Winnipeg River. Environmental Management Division. May 1982. 14pp.

SUMMARY

This report was prepared as part of the "Public Participation Program". Chlorophyll 'a' and Secchi disc data for 1979 to 1981 were presented. The 1981 chlorophyll and transparency results were variable within the Winnipeg River system but tended toward moderate algae populations and moderate water clarity. Trophic state indices (TSI) indicated that the lakes on the Winnipeg River system were mesotrophic to eutrophic in nature.

REPORT 82-28 Beck, A. E. (1982). An Investigation of Potential Pollution of Gods Lake by Leachate From an Abandoned Gold Mine. Environmental Management Division. December 1982. 71pp.

SUMMARY

During the period 1935 to 1943, Gods Lake Gold Mines Limited mined and processed 490,812 tonnes of ore on Elk Island of Gods Lake. Operational wastes

were discarded to an adjacent tailings disposal site. Concerns respecting possible pollution of Gods Lake by metal and acid leachate emanating from the tailings disposal site prompted a study in June, 1981.

Three sites were selected for the study: the Elk Island bay adjacent to the tailings disposal site, an area near the lake outlet which served as a downstream comparison, and the influent area of the south basin which served as the control. Water samples collected randomly from each site were analyzed for sixteen physicochemical parameters and nine metals. Sediments, macrobenthic shoreline invertebrates and representative fish samples from each site were analyzed for seven metals. Where possible, site data were compared statistically.

It was determined that leachate emanating from the tailings disposal area had indeed resulted in elevated sediment metal concentrations within an area of approximately 0.25 square kilometres of lake surface southwesterly adjacent to the disposal site. Mercury, arsenic, copper, lead, nickel, zinc and iron concentrations were observed to increase exponentially in lake sediments as the mouth of the major stream draining the tailings disposal site was approached. A similar relationship with cadmium, manganese and cyanide concentrations was not evident. Mercury, arsenic, cadmium, lead and zinc were found to have accumulated at levels greater than background in the body tissues of macroinvertebrates colonizing the affected area. Bioaccumulation of metals by fish and contamination of the water column from leachate of the disposal area was not detected in this study.

REPORT 82-29 Williamson, D. A., and Brown, D. J., 1982. Red River Water Quality; Scientific Support Documentation of Water Quality Changes. Environmental Management Division. July 1982. 122pp.

SUMMARY

The surface water quality of the Red River was examined by the Clean Environment Commission during December, 1980, January, 1981, and February, 1981, during a process designed to establish water quality objectives for the Red River Principal Drainage

Division. Evidence presented at public hearings on this subject, indicated that the water quality of the Red River, through and downstream of the City of Winnipeg was not of sufficient good quality in order that all expected and desired uses could be achieved. This report describes some of the surface water quality changes that have occurred over time and over river distance as shown by statistical analyses of the available information. Red River water quality data was also compared to the applied surface water quality objectives for this stream.

It was found that dissolved oxygen levels were increasing with time downstream of the City of Winnipeg. It appears that over the period of record, the microbiological quality of the Red River, as indicated by the total coliform and faecal coliform data, has improved at numerous locations along the entire reach of the Red River. In addition, total Kjeldhal nitrogen levels have increased over the period of record at numerous sampling locations.

Increased levels of total coliform and faecal coliform bacteria, total Kjeldhal nitrogen, nitrate-nitrite nitrogen, total phosphorus and percent saturation concentrations of dissolved oxygen were observed downstream of the City of Winnipeg when compared with concentrations from upstream sampling locations.

Increases were also observed for total Kjeldhal nitrogen, nitrate-nitrite nitrogen, total phosphorus and total coliform and faecal coliform bacteria levels in the Assiniboine River at Main St. Bridge, Winnipeg, when compared with data collected upstream at Headingley. Decreases within this reach of the river were also observed for dissolved oxygen and turbidity. The Assiniboine River, a major tributary of the Red River, was included to aid in the interpretation of results downstream of their confluence.

It was evident that Manitoba's surface water quality objectives for dissolved oxygen and nitrate-nitrite nitrogen were being achieved within all reaches of the Red River, with rare exceedances being recorded for dissolved oxygen. Water quality objectives for total coliform and faecal coliform bacteria were being exceeded upstream of the City of Winnipeg on few occasions, and were being regularly exceeded through and downstream of the City of Winnipeg.

REPORT 82-30 Hughes, C. (1982). A Report on the Trophic Status of Killarney, Wahtopanah, Rossman and Sandy Lakes. Environmental Management Division. July 1982. 13pp.

SUMMARY

Chlorophyll 'a' and Secchi disc data for 1979 to 1981 were presented. The data indicated that Killarney Lake was eutrophic, Lake Wahtopanoh was eutrophic, Rossman Lake was mesotrophic to eutrophic and Sandy Lake was mesotrophic.

REPORT 82-31 Wilson, D. (1982). Bathymetry and Morphometry of Trout and Cliff Lakes. Environmental Management Division. October 1982.

SUMMARY

Concerns were expressed that the development of the Trout Lake Mine might affect the quality of water flowing from Trout Lake to Cliff Lake. Flin Flon derives its water supply from Cliff Lake. Water Standards and Studies Section conducted a predevelopment study in 1981 with the aid of bathymetric and morphometric information obtained in 1980. This report details the data obtained in 1980.

AUDIO-VISUAL PROGRAMS

1.) Brown, D. J., Williamson, D. A. and Sekla, L.*, 1982. Red River Water Quality. Environmental Management Division. Water Standards and Studies Section. July 1982. 20 mins.

SUMMARY

A technical presentation explaining current water quality in the Red River from the Canada/United States border to Lake Winnipeg. It covers various water quality parameters and the changes observed in water quality through and downstream of the City of Winnipeg. The parameters discussed are as follows:

Dissolved oxygen
Nitrate-nitrite nitrogen
Total Kjeldhal nitrogen
Total phosphorus
Total organic carbon
Total coliform
Faecal coliform
Viruses
Salmonella
Antibiotic Resistance

2.) Environmental Standards and Studies.** 1982. Acid Precipitation. Environmental Management Division. Environmental Management Services Branch. November 1982. 25 mins.

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**This was produced by staff of
Air Standards and Studies and
Computer Services Section
Terrestrial Standards and Studies Section
Water Standards and Studies Section.

SUMMARY

An overview of the potential effects of acid precipitation on Manitoba's air, water and terrestrial environments. Included are brief descriptions of Manitoba's data base and activities related to the long range transport of air pollutants.

POOR

QUALITY

ORIGINAL